

S P E C I F I C A T I O N

## CANOPY RELEASE LOCKING BAR

## BACKGROUND OF THE INVENTION

The field of the invention is canopy release mechanisms and the invention related more particularly to the release of harnesses of the type used by the crew of an aircraft.

U.S. Patent No. 5,857,247 assigned to the assignee of the present application discloses a buckle system having many features of the mechanism of the present invention. This patent is incorporated herein by reference for background purposes.

There is a need for canopy release mechanisms which require less strength to open. The release mechanism shown in U.S. Patent No. 5,857,247 meets this requirement. It is essential, of course, that such easier opening mechanisms remain closed until the wearer actively releases the same.

## BRIEF SUMMARY OF THE INVENTION

The present invention is a locking bar of a parachute canopy release to keep the cover of the release mechanism closed down over the actuating lever until disconnect is desired. The locking bar prevents the cover of the canopy release from

1 inadvertently opening when subjected to an angular acceleration  
2 about the webbing pin. When the canopy release is subjected to  
3 an angular acceleration of sufficient magnitude, the cover will  
4 begin to rotate outwardly from the actuation lever. The locking  
5 bar will rotate in the opposite direction and more fully engage  
6 the locking pins, preventing the cover from rising. When the  
7 locking bar is manually moved to an open position, the movable  
8 cover may be opened, exposing the actuating lever, thereby  
9 permitting the release mechanism to release the harness.  
10 Knurling is added to the leading edge of the locking bar to  
11 assist pilots and crew members to open the release while wearing  
12 gloves or while suffering an injury sustained before or during  
13 descent on the parachute. Preferably, an automatic release  
14 mechanism is included which activates the canopy release when  
15 immersed in water. The electronic portion of the water  
16 activating system is preferably removably held to the bottom of  
17 the frame of the release mechanism.

#### 18 BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

19 Figure 1 is an exploded perspective view of the parachute  
20 canopy release mechanism of the present invention.

1           Figure 2 is a cross-sectional side view of the parachute  
2 canopy release mechanism of the present invention showing the  
3 locking bar in a locked position.

4           Figure 3 is a cross-sectional view thereof showing the  
5 locking bar in a release position.

6           Figure 4 is a cross-sectional view showing the cover in an  
7 opened position.

8           Figure 5 is a cross-sectional side view showing the  
9 activating lever in an opened position.

10          Figure 6 is a cross-sectional side view showing the latch  
11 mechanism in an opened position.

12          Figure 7 is a cross-sectional view showing the released  
13 strap holding member and the cover moved downwardly into contact  
14 with the actuating lever.

15          Figure 8 is a cross-sectional side view of the parachute  
16 canopy release mechanism of Figure 1 showing the water activated  
17 release mechanism prior to activation.

18          Figure 9 is a cross-sectional view of the mechanism of  
19 Figure 8 showing the water activated release mechanism initiating  
20 the opening of the locking bar.

1           Figure 10 is a cross-sectional view analogous to Figure 8,  
2           except showing the locking bar in a fully unlocked position.

3           Figure 11 is a cross-sectional view analogous to Figure 1-  
4           showing the initiation of the opening of the cover.

5           Figure 12 is a cross-sectional view analogous to Figure 11  
6           and further showing the activation of an arm to open the  
7           actuating lever and to release the latch.

8           Figure 13 is a cross-sectional view showing the final  
9           position of the actuating lever opening latch.

10          Figure 14 is a side view of the water actuated opening  
11          mechanism of Figures 8-13.

12          Figure 15 is analogous to Figure 14 with the triggering  
13          lever rotated partially in a counter clockwise direction.

14          Figure 16 is a side view analogous to Figure 15 with the  
15          triggering lever in a further counter clockwise position.

16          Figure 17 is a view analogous to Figure 7 with the  
17          triggering lever in a fully counter clockwise position.

#### 18                           DETAILED DESCRIPTION OF THE INVENTION

19          The parachute canopy release mechanism of the present  
20          invention is shown in exploded perspective view in Figure 1 and  
21          indicated generally by reference character 10. Mechanism 10 has  
22          a frame 11, one side of which is shown in Figure 1. The frame

1 extends under the bottom of the mechanism and has a mirror image  
2 part not shown on the other side of the mechanism. The frame  
3 permanently supports a harness look securement pin 12. A  
4 parachute strap holder 13 is shown in, for instance, Figure 2  
5 which is released from mechanism 10 when opened.

6 An actuating lever 14 is held by a pair of hinge pins 15 and  
7 16, held by frame 11. Actuating lever 14 has a pair of latch  
8 holding ledges, one of which is shown in Figure 1 and indicated  
9 by reference character 17. Latch holding ledge 17 holds latch 18  
10 in a closed position. The hinge pin for latch 18 is supported by  
11 the frame at the location indicated by reference character 18'.  
12 Latch 18 has a latch tooth 19 shown in Figure 2. Also as shown  
13 in Figure 2, latch tooth 19 holds a tang tooth 20 of tang 21 of  
14 parachute strap holder 13.

15 Actuating lever 14 is protected by an interlocking cover 22.  
16 Interlocking cover 22 has a hinge pin 23 which passes through a  
17 pair of openings 24 to pivotally hold interlocking cover 22 in  
18 place. Hinge pin 23 is held by a pair of openings 25 in frame  
19 11. A spring urges the cover in a closed position. A closed  
20 position is counter clockwise as viewed in Figure 1. Actuating  
21 lever 14 is urged in a closed position by spring 35 which is held  
22 at one end by groove 36 in actuating lever 14 and at the other  
23 end by retaining clip 37 which is held by latch 18.

1           A canopy release locking bar 27 is held by a long pin 28.  
2           Long pin 28 is held by a pair of openings 29 in interlocking  
3           cover 22. A spring 30 is located over long pin 28 and urges the  
4           canopy release locking bar 27 in a locked position. A locked  
5           position is clockwise as viewed in Figure 1.

6           Canopy release locking bar has a frame engaging member which  
7           is a cam 31. Cam 31 engages pins 32 held by frame 11. The  
8           locking and unlocking details will be discussed below. Canopy  
9           release locking bar 27 preferably has knurling 32. This knurling  
10          consists of horizontal grooves 33 and vertical grooves 34. This  
11          knurling is positioned on the leading edge of locking bar 27 and  
12          assists pilots and crew members to open the release while wearing  
13          gloves or suffering an injury sustained before or during descent  
14          on the parachute.

15          Frame 11 has a pair of vertical side plates 38 and 39. Side  
16          plate 39 is shown in Figure 2, as is the floor 40 of frame 11.  
17          Frame 11 has a longitudinal axis 41 and a transverse axis 42.

18          The operation of the canopy release locking bar 27 is shown  
19          by viewing Figures 2, 3, 4, 4, 6, and 7. In Figure 2, locking  
20          bar 27 pivots about long pin 28 and is in a fully clockwise  
21          position. In this position, locking pin 32 holds cam 31 so that  
22          the hinged cover 22 cannot be opened. To open cover 22, locking  
23          bar 27 is rotated in a counter clockwise direction shown in

1     Figure 3. In this position, the cam 31 no longer contacts pin 32  
2     and hinged cover is allowed to open as shown in Figure 4. This  
3     exposes actuating lever 14 so that the pilot or crew member can  
4     move it in a clockwise direction as shown in Figure 5. This  
5     releases the hold of ledge 17 on latch 18 and permits latch 18 to  
6     move in a counter clockwise direction as shown in Figure 6.  
7     Latch 18 is biased to move in a counter clockwise direction by  
8     actuating lever spring 35 as shown in Figure 1. This releases  
9     parachute strap holder 13 as shown in Figure 7. Also, as shown  
10    in Figure 7, the hinged cover 22, as well as locking bar 27, are  
11    biased toward a closed position and contact actuating lever 14.

12         It is useful that this series of opening steps be provided  
13    automatically in the event the pilot or crew member is unable to  
14    do so after landing in water. Such a mechanism is shown in  
15    Figures 8, 9, 10, 11, 12, and 13. The important feature of this  
16    mechanism is that the water activated release triggering  
17    mechanism 50 is removably held over a portion of floor 40. In  
18    this way, any improvements in the release triggering units can be  
19    simply added by removing the old unit and replacing it with an  
20    updated unit. The details of the triggering unit are now shown  
21    herein since various mechanisms are known which can cause the  
22    movement when immersed in water. The parachute canopy release  
23    mechanism 10 has a triggering lever 51 which extends below the

1 bottom of floor 40. The release triggering unit 50 includes  
2 means to move triggering lever 51 forward as shown in Figure 8.  
3 Triggering lever 57 is linked to a lever cam 52 and a cover cam  
4 53. The unit is shown in a closed position in Figure 8.

5 Once immersed in water, the release triggering unit 50 moves  
6 triggering lever 51 forward, which in turn causes cover cam 53 to  
7 move in a clockwise direction as shown in Figure 9. A contact  
8 cam 54 is formed on the bottom of canopy release locking bar 27.  
9 In this way, the clockwise movement of cover cam 53 causes the  
10 counter clockwise movement of locking bar 27.

11 As shown in Figure 10, the locking bar 27 has been moved in  
12 a fully counter clockwise position and cover cam 53 continues in  
13 a clockwise direction shown in Figure 11, where it lifts cover 22  
14 sufficiently so that actuating lever 14 can be opened. This is  
15 accomplished by the clockwise motion of lever cam 52 as shown by  
16 comparing Figures 10, 11, and 12. When the triggering lever 51  
17 is in its forward most position shown in Figure 12, the latch  
18 tooth 19 has released latch tooth 20 analogous to the position  
19 shown in Figure 7 of the drawings.

20 The mechanism of the driving of the lever cam and the cover  
21 cam are shown in Figures 14, 15, 16, and 17. Triggering lever 51  
22 is pivoted about pin 54 and has a driving cam contact surface 55.  
23 Surface 55 is contacted by a driving cam which is part of the



1     removable water actuated release triggering unit. Lever 51  
2     extends below floor 40 of frame 11 as the driving cam contact  
3     surface is urged forwardly to move triggering lever in a counter  
4     clockwise position shown in Figure 15. Triggering lever 51 has a  
5     cover cam portion 56 which contacts a cover cam contact surface  
6     57 on lever 58 connected to cover cam 53. As the triggering  
7     lever 51 is further moved counter clockwise to a position shown  
8     in Figure 16, the lever trigger cam 59 contacts the lever cam arm  
9     contact surface 60, moving lever cam 52 in a clockwise direction  
10    essentially as shown in Figure 12 of the drawings. As the  
11    triggering lever 51 is moved to its forward most position, the  
12    lever cam 52 is permitted to move back to its counter clockwise  
13    position as the parachute strap holder has already been released.

14           Thus, it can be seen that the mechanism shown in Figures 14,  
15    15, 16, and 17 are actuated no matter how the triggering lever 51  
16    is moved forward. Thus, various mechanisms can be affixed to the  
17    bottom of parachute canopy release mechanism 10 and will cause  
18    the automatic release of the parachute strap holder.

19           Directional terms such as clockwise or up or down are, of  
20    course, used to describe the devices as viewed in the drawings.  
21    It is to be understood that the mechanism operates in any  
22    orientation and that these terms are used to simplify the  
23    descriptions herein.

1           The present embodiments of this invention are thus to be  
2       considered in all respects as illustrative and not restrictive;  
3       the scope of the invention being indicated by the appended claims  
4       rather than by the foregoing description. All changes which come  
5       within the meaning and range of equivalency of the claims are  
6       intended to be embraced therein.